

REMARKS

Reconsideration of the instant application is respectfully requested. The present amendment is responsive to the Office Action of January 11, 2005, in which claims 1-19 are presently pending. Of those, claims 1-7, 11 and 12 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 5,708,371 to Koyama, in view of U.S. Patent 4,555,626 to Suzuki. In addition, claims 8-10 have also been rejected under 35 U.S.C. §103(a) as being unpatentable over Koyama in view of Suzuki, and further in view of U.S. Patent Publication 2002/0162339 of Harrison, et al.

Claims 13 and 17-19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Koyama in view of Suzuki, and further in view of U.S. Patent 6,863,787 to Huynh, et al. Finally, claims 14-16 are rejected under 35 U.S.C. §103(a) as being unpatentable over Koyama in view of Suzuki and Huynh, and further in view of U.S. Patent 6,372,627 to Ring, et al. For the following reasons, however, it is respectfully submitted that the application is now in condition for allowance.

As an initial matter, Claim 16 been amended as set forth above to address the §112 rejection thereto by correcting the typographical error identified by the Examiner. The second instance of "TEOS with O₂" in claim 16 has been replaced with --TMCTS with O₂--. In addition, a typographical error has also been corrected in claim 7.

As to the substantive §103 rejections of each of the pending claims, the Applicants respectfully traverse the same for the reason that the cited art of record does not in fact teach or suggest the desirability of lowering sample temperatures for focused ion beam (FIB) processes, and more specifically for material deposition and removal process as recited in claims 13-19. Consequently, at the time of the invention, there would be no motivation for a skilled artisan to combine an FIB apparatus with any of the cooling mechanisms disclosed in the cited references in order to arrive at the claimed

invention. Moreover, (and contrary to the Examiner's statement at the bottom of page 2 of the Office Action), a laser scanning microscope is not an equivalent of an FIB apparatus, as is outlined in more detail below.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that (1) all elements of the claimed invention are disclosed in the prior art; (2) that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references; and (3) that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

With regard to the second element, there are three possible sources for a motivation to combine (or modify) references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a *prima facie* case of obvious was held improper.). The level of skill in the art cannot be relied upon to provide the suggestion to combine references. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999). Furthermore, the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

A statement that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the claimed

invention was made' " because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See also *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000).

The Examiner's rejections of the present claims using Koyama ('371) as the primary reference is based upon the following statement at the bottom of page 2 of the Office Action:

"'371 (does) not explicitly teach that the system is a FIB system, but instead is a laser scanning microscope, which are art-recognized equivalents."

The Applicants respectfully submit, however, that this is not in fact the case. While it is true that FIB systems can also be used for defect analysis in addition to material deposition and removal (as stated, for example, in column 1, lines 42-46 of Koyama and in column 1, lines 52-60 of Huynh), an FIB system designed for sample analysis does not operate in the same manner as a laser scanning microscope. In the case of an FIB imaging system, the intensity of the image is determined by secondary electrons or other particles that are ejected by the ion beam at the corresponding point on the substrate. (Huynh, column 1, lines 52-57)

In contrast, a laser-based imaging system operates by focusing a laser beam on a sample having an applied current flowing therethrough. The laser-irradiated sample area is heated and its resistance is increased. This in turn results in less current flowing through the sample, the change in which is displayed through an image information converter. (Koyama, column 1, line 58 - column 3, line 18) In fact, the Koyama reference itself actually distinguishes between the two types of analysis methods, and goes so far as to point out the limitations of the FIB/SEM (surface potential contrast)

technique with respect to the OBIRCH (Optical Beam Induced Resistance Change Methods) systems disclosed therein (col. 1, lines 42-54).

The stated motivation of Koyama for providing a cooling unit in the embodiment of Figure 14 is the increased current corresponding to the void detection sensitivity, which is enhanced by cooling the sample to be measured. Accordingly, since the present claims are not directed toward an apparatus/method for laser-based sample imaging in which a current is passed through a sample, one skilled in the art would not be motivated to provide a cooling unit in conjunction with an FIB processing apparatus, because there is no purpose recognized in the prior art for doing so. Huynh is the only cited reference that discloses an FIB apparatus (for material removal), and is silent as to teaching or suggesting a need for sample cooling.

Moreover, with regard to method claims 13-19, it will again be noted that the Koyama reference discloses a laser-based scanning microscope that is used for analysis of a formed semiconductor structure, such as aluminum interconnection lines for example (Koyama, column 1, lines 14-42). In contrast, the claims 13-19 of the present application are directed toward an FIB method for deposition and removal of materials on a semiconductor structure. Therefore, because these claims relate to material deposition/removal, an FIB apparatus in this instance would not even be used for sample analysis purposes at all. Thus, there is even less motivation to utilize the teachings of Koyama to provide sample cooling, since the stated benefits of such cooling in Koyama are inapplicable to FIB deposition/removal techniques.


Therefore, it is respectfully submitted that each of the outstanding §103 rejections of claims 1-19 have been overcome, and it is respectfully requested that the same be withdrawn.

For the above stated reasons, it is respectfully submitted that the present application is now in condition for allowance. No new matter has been entered and no additional fees are believed to be required. However, if any fees are due with respect to this Amendment, please charge them to Deposit Account No. 09-0458 maintained by Applicants' attorneys.

Respectfully submitted,
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